JMAEV REG NO 45,669

METHOD AND APPARATUS FOR DELIVERING DISSIMILAR ENTERTAINMENT AND ADVTERTISING CONTENT TO A PLURALITY OF SUBSCRIBERS

RELATED APPLICATIONS

This application claims priority to it's provisional parent "SYSTEM, METHOD, AND ARTICLE OF MANUFACTURE FOR DELIVERING DISSIMILAR ENTERTAINMENT AND ADVTERTISING CONTENT TO A PLURALITY OF SUBSCRIBERS" filed on October 5, 1999 and having received an application number of 60/157,713.

FIELD OF THE INVENTION

The present invention relates to the broadcast industry, the blossoming on-demand content delivery industry and the delivery of demographically targeted commercial messages.

BACKGROUND OF THE INVENTION

The broadcast industry develops revenue by selling advertising time. In the prior art, broadcasters prescribe the programming that a particular channel will carry. Subscribers tune to various channels until they find a program that suits their taste and interest. The advertisers buy segments of time wherein they proclaim the virtues of their product or service or perhaps convey some other message. The advertisements that they present are called "spots".

The industry has remained fundamentally unchanged for decades. Programs plans for channels are constantly modified in hopes of capturing a larger segment of the market. Advertisers buy spots in prime program intervals in hopes of maximizing the exposure of their advertisements.

Even still, the advertisers have very little control over the types of subscribers that will see their ads. Very little has been achieved in segmenting the advertising venue along demographic lines. Such segmentation would maximize the chance that advertisements would bee seen by interested parties rather than by a disinterested mass.

Prior art has attempted to segment viewers by developing specialized channels. This has led to a class based advertising paradigm. Sporting goods could be advertised on a sports channel while office products could be advertised on business channel. What is really needed is the ability to selectively advertise to subscribers that are not only in an interest class, but to those that are specifically interested in the advertisers product. By allowing advertisers to direct their message to subscribers based on detailed demographic data would ensure that the advertiser would achieve the best possible result. A side benefit would be that more advertising could be supported by the broadcast channel since each subscriber would have a specific advertisement even though they are watching the same channel.

Achieving this type of demographically specific advertising, a notion called "pointcasting", required the development of innovative distribution techniques. Pointcasting is not a new notion. Attaining true pointcasting, though, requires extensive bandwidth on a medium so that every subscribers could be addressed individually.

The cable television industry is a fine example of how pointcasting could be applied. A typical cable television system distributes program content on a single cable. That cable is routed to a plurality of subscribers and delivers the same content to each subscriber. Since each subscriber could conceivable be demographically diverse, it goes without saying that to achieve pointcasting on a cable television distribution network, the network would need to be able to deliver dissimilar content to each subscriber. A typical cable television system may serve over 10,000 subscribers. This then implies that 10,000 channels would have to be carried on the cable. With most distribution system capable of carrying only a hundred channels or so, cable television systems simply does not have the bandwidth to accomplish pointcasting.

The same problem faces the delivery of entertainment content on demand. This is typically called video-on-demand (VOD) service. VOD service also requires a separate conduit to each subscriber to ensure that each subscriber can request a program on-demand, irrespective of what any other subscriber wants to watch. This means that a VOD system must be able to retrieve massive quantities of entertainment content in a random fashion and deliver it to the subscriber.

Recent advances in compression of digitized audio and video have enabled the efficient storage of entertainment content and have facilitated the retrieval of that content in essentially a random manner. These compression techniques include the MPEG standards that compress a two hour movie into roughly 2 GBytes of data.

Delivering pointcast programming requires wide bandwidth to service a plurality of customers. Other advances in multi-state modulation technology have provided high data bandwidth density. Quadrature Amplitude Modulation (QAM), for instance, packs 30 millions bits of data per second into a 6 MHz band.

By using digitally compressed content and the advanced modulation techniques, a cable television system can delivery roughly fifteen time the content when compared to traditional analog video modulated onto a 6 MHz wide channel. Even this fifteen fold bandwidth improvement will fall short of being able to supply dissimilar content to 5,000 subscribers.

SUMMARY OF THE INVENTION

The present invention is a method and apparatus that provides pointcast capability to a plurality of subscribers that is fully expandable. The subscriber base is segmented into a plurality of facilities that each have a number of subscribers that can be readily accommodated by the bandwidth of a regular cable television system. Each facility receives direct broadcast of entertainment content either from the cable televisions backbone, from satellite feeds or from off-air sources. Each of the plurality of facilities digitizes and compresses the entertainment content and forms a plurality of content streams and then uses multi-state modulation develop modulated content streams. The modulated content streams are then converted to different frequency bands before they are delivered to the distribution network.

Each facility is connected to a distribution center. The distribution center dispatches both entertainment content and advertising spots to the plurality of facilities where it is stored in "pointcast" servers. The distribution center can transmit the content either by way of computer readable media or it can electronically mail the content to the facilities. A file server in each of the plurality of facilities builds scripts of advertising spots for each subscriber based on *a priori* demographic data. The advertisers specify which subscribers they want to target and with what promotional material. Before the broadcast entertainment content is compressed, demographically targeted advertising spots are injected into the digital content data to form seamless content stream. The entertainment content is then delivered to the distribution network.

For VOD service, pointcast servers in the plurality of facilities respond to real-time requests from the subscribers. Entertainment content is stored in the pointcast server and is accessed in a random manner. The pointcast server delivers compressed and modulated entertainment content. This content is then converted to a distinct frequency band and delivered to the subscriber by way of the distribution network.

Advertising content and entertainment content are managed through the use of content descriptors. For commercial advertisement, the content descriptors comprise such information as the date and time that an advertisement should be presented as well as demographic codes and presentation strategy indicators that facilitate their targeted distribution. Entertainment content descriptors comprise start and end dates as well and further comprise information regarding when and if advertisements can be aired during the presentation of the entertainment content.

The major processing thread associated with advertising is the creation of delivery scripts for each of a plurality of users. For each subscriber, all of the commercial content descriptors are examined for presentation requirements. Advertisements that must air at specific, contractually required times and are broadcast in nature are assigned to each delivery script. Advertisements with less stringent presentation requirements are next assigned to each delivery script. Finally, directed advertisements are assigned to each subscribers delivery script commensurate with demographic affiliated with each individual subscriber.

The targeted delivery server is a novel apparatus that embodies the present method of injecting advertising content. Using either insertion signals and/or codes and or timing epochs, the targeted delivery server supplants the entertainment content being delivered to a subscriber with commercial content according to the delivery script. Otherwise, the targeted delivery server delivers entertainment according the requests received from the subscriber.

The overall system is based on the use of virtual conduits which is a bandwidth reservation scheme. This is an important element of the invention in that it assures that the distribution network will always have adequate bandwidth to deliver dissimilar content to each and every subscriber. The targeted delivery server is comprises of broadcast receivers that have alternating buffers. Broadcast entertainment is fed into one of the buffers while the alternate buffer is available to provide broadcast content to a plurality of stream packers. The stream packers are comprised of multiplexers that select the output of the broadcast receivers. The enhanced

targeted deliver server can select broadcast programs based on subscriber requests just like the standard server but can also inject demographically targeted advertisements based on a delivery script.

BRIEF DESCRIPTION OF THE FIGURES

The foregoing aspects are better understood from the following detailed description of one embodiment of the invention with reference to the drawings, in which:

Fig. 1 shows how facilities are connected by way of a inter-facility computer network;

Fig. 2 illustrates the staging of entertainment and advertising content before it is dispatched to the facilities;

Fig. 3 is a diagram showing how entertainment and advertising content is assembled into e-mail attachments;

Fig. 4 presents the structure of a table that describes entertainment content packages;

Fig. 5 presents the structure of a table that describes commercial advertising content packages;

Fig. 6 is a flowchart showing the various operations associated with dispatching content to the facilities in the present invention;

Fig. 7 presents the compliment of equipment in each facility that processes incoming content;

Fig. 8 is a flow diagram that shows the steps involved in receiving content at the plurality of facilities;

Fig. 8A shows how broadcast subscribers leach content from common conduits.

Fig. 8B shows how a new paradigm creates virtual conduits for each of a plurality of subscribers and funnels content to each.

Figs. 9 is a flow chart that shows the process used in the plurality of facilities to schedule advertising spots in the present invention;

Fig. 9A depicts the structure of a table that correlates each of a plurality of subscribers to a plurality of demographic codes.

Fig. 10 shows the structure of a plurality of tables maintained at each of the plurality of facilities to schedule the presentation of advertising spots in a pointcast manner;

Fig. 11 shows the structure of a plurality of tables used to schedule the presentation of advertising spots to a plurality of subscribers for VOD service in a pointcast manner;

Figs.12 illustrates the internal structure of a pointcast server;

Fig. 12A illustrates the use of delivery scripts in the composition of a content stream;

Fig. 13 illustrates the internal structure of a tuner assembly used in the pointcast server of Fig. 12;

Fig. 14 illustrates the internal structure of a satellite tuner assembly used in the pointcast server of Fig. 12;

Fig. 15 illustrates the internal structure of a content stream packer used in the pointcast server of Fig. 12;

Fig. 16 deleted;

Fig. 17 describes the manner in which the content stream packer of Fig. 15 manages content streams based on packet descriptors;

Fig. 17A shows how one multi-state modulated channel carries a plurality of streams;

Fig. 18 presents the internal structure of the frequency converter used in the plurality of facilities in the present invention;

Fig. 19 presents a diagram of the internal structure of a converter module used in the frequency converter of Fig. 18;

Fig. 19A demonstrates how digital slope correction is accomplished;

Fig. 20 presents a typical prior art distribution system used in the prior art cable television system;

Fig. 21 presents the structure of the digital-branch-node of the present invention used to upgrade the distribution system depicted in Fig. 20;

Fig. 22 depicts the segmentation of a cable television system into a plurality of facilities;

Fig. 23 shows how subscribers with similar demographics can be grouped together into facilities and those facilities can be networked together;

Fig. 24 depicts the structure of a table that is used to assign streams to a plurality of subscribers;

Fig. 24A presents the internal structure of a reception unit;

Fig. 24B depicts a display unit;

Fig. 24C depicts the keyboard and infra-red receiver attached to the reception unit of Fig. 24A;

Fig. 25 shows how the reception unit of Fig. 24A is adapted to a hospital bed and used to drive a display head;

Fig. 26 shows an alternative mounting method for the display head;

Fig. 27 shows how the display head is stowed away in the alternative mounting method;

Fig. 28 depicts the constituent components of the display head.

DETAILED DESCRIPTION OF THE INVENTION

System Description

The present invention is a system, method and article of manufacture that enables the delivery of dissimilar entertainment content and advertising spots to a plurality of subscribers. The present invention segments a population of subscribers into a plurality of facilities wherein each facility has the capability to delivery dissimilar content to all of the subscribers therein.

Fig. 1 introduces the present invention as comprising distribution center 10, a plurality of facilities 15, security processor 25, and dial-up modem 30. The plurality of facilities 15 are connected to distribution center by way of inter-facility computer network 20.

Distribution center 10 accepts entertainment content and commercial advertising content. Entertainment content can include, inter alia, first run movies, documentaries, and home improvement tutorials. Commercial advertisements are also received by distribution center 10.

Entertainment content and advertising content received by distribution center 15 is first categorized according to applicable dissemination. Some entertainment content will only be dispatched to certain regions in the country while other content will be nationally distributed. The same categorization is performed for advertising content.

Fig. 2 shows how each of the plurality of facilities 15 may receive a different set of content, both advertising spots and entertainment content. As seen in the figure, facility "A" receives advertising spots that are peculiar to the geographic region that facility serves. Examples of advertising spots that are regional include spots for dry-cleaners and pizza restaurants. Facility "A" also receives advertising spots that have national presentation. These may include ads by

automobile manufactures, insurance carriers and the like. Facility "A" will also receive entertainment content specific for it's region and national entertainment content. Examples of regionally specific entertainment content could include pre-recorded local public access and informational channels. Each facility in a cable television system is similarly examined by the process in distribution center 10.

Fig. 3 demonstrates that once the content for each of the plurality of facilities 15 is identified, distribution center 15 composes a plurality of e-mail messages to effect the dispatch. Distribution center 15 will collect all national entertainment content and advertising spots at attach these to one or more e-mail messages addressed to each of the plurality of facilities 15. Content bound only for a particular region will be collected together and attached to one or more separate e-mail messages addressed only to the appropriate facility 15. Hence, all of the plurality of facilities 15 will receive two or more e-mail messages; one or more for the national content and one or more for the regional content.

Processing Entertainment and Ad Content

Fig. 4 depicts entertainment content descriptor header 35. Distribution center 15 creates a plurality of entertainment content descriptors 35 corresponding to all entertainment content it receives. Entertainment content descriptor 35 comprises a plurality of entries including, but not limited to:

1. Title

   This is the title of the entertainment content and can be either a title code or an actual alphanumeric title;

2. Start Date

   This field defines the date that the content can not be presented before. This date field is populated with a value customarily provided by the content provider as a "do not show until" date;

3. End Date

   This field defines the date after which the content can not be presented. This field may be populated by an actual date indicating that presentation of the content is restricted after the date or it may include a null value. The null value indicates that the content can be presented on an indefinite basis;

4. Presentation Price

   The Presentation Price field indicates to the amount of compensation the content provider expects to realize from every showing of the content;

5. Content Type

   The content type field indicates if the entertainment content is a first run movie, a classic movie, audio-only content, or a computer animation game;

6. Spot Allowance

   The spot allowance filed indicates the quantity of advertising spots that can be inserted into the entertainment content during a period of time. This field is ordinarily populated with a number such as "6 30-second spots per hour";

7. Store Address

   The store address field is not populated by distribution center 10. This field is used by the facility 15 to store the address where the content is stored in a pointcast server;

8. Content Length

   The content length indicates the run time, unedited, for the entertainment content;

9. Region

   The region field indicates if the content can be presented nationally or if presentation is limited to a particular region. In the event that regional restrictions are applicable to the content, this field points to a list of regions 40 where the content can be presented.

Fig. 5 depicts the structure of commercial content descriptor 45. Distribution center 10 creates a plurality of commercial content descriptors 45 corresponding to the plurality of commercial advertising spots it receives. Commercial content descriptor 45 includes as a minimum the following fields:

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1. Spot Number

   This is a numeric number of the spot that is assigned by the distribution center and is used for tracking the presentation history of the advertisement;

2. Start Date

   The start date field indicates when the advertisement will initially be presented;

3. End Date

   The end date field indicates when the advertisement will expire;

4. Presentation Level

   The presentation level indicates how many time during a saturation window the advertisement will be presented;

5. Start Window

   The start window field indicates the beginning of a time slot that the advertising content will be presented;

6. End Window

   The end window field indicates the end of a time slot that the advertising content will be presented;

7. Presentation Strategy

   Each advertisement received by distribution center 10 is categorized as either a broadcast advertisement or a pointcast spot. When the advertisement is a broadcast spot, this field contains a null value. Otherwise, a demographic code is stored in this field. The demographic code is used to direct the advertisement to target subscribers based on the demographic complexion of the suscriber;

8. Store Address

   The store address field is not populated by distribution center 10. This field is used by the facility 15 to store the address where the content is stored in a pointcast server;

9. Store Length

   The store length filed indicates the running time, unedited, of the advertisement;

10. Region

    The region field indicates if the content can be presented nationally or if presentation is

limited to a particular region. In the event that regional restrictions are applicable to the content, this field points to a list of spot regions 50 where the content can be presented is assembled and carried along with the entertainment content.

11. Presentation Times

Some advertising spots must be presented as certain times as designated in an advertising contract. If the spot can be run within the time slot and at a defined saturation level, this filed has a null value. Otherwise, this field contains a pointer to a list of presentation times 55 that are mandated by a contract.

Fig. 6 summarizes the steps that distribution center 10 in the present invention performs when processing content. There are five major steps in all comprising: 1) receiving content from the provider (step 60); 2) categorizing the content (step 70); 3) fetching a cipher key (step 80); encrypting the content (step 90); and e-mailing the content to some or all of the facilities (step 100).

Step 60, that of receiving the content, includes receiving entertainment content from movie distributors and advertising content from promoters. Entertainment content can also include documentaries, educational programming, audio-only content and other forms of entertainment not listed here. When the entertainment content is received, it must be accompanied by any restrictive conditions that apply to the presentation thereof. Generally, the content must arrive with information required by distribution center 10 to create entertainment content descriptor 35 and region table 40.

Receiving advertising spots is akin to receiving entertainment content. The content must be accompanied by any presentation requirements the advertiser has bargained for with the cable television system. The presentation information includes, inter alia, the effectivity dates of the spot, the saturation level and strategy and any mandatory presentation times required by the sponsoring entity. Distribution center 10 will use this information to create commercial content descriptor 45 for each ad spot.

Step 70 comprises the actual categorizing of the content. Distribution center 10 begins by creating content descriptors for each piece of content. For entertainment content, distribution center 10 creates a plurality of entertainment content descriptor 35 together with their subordinate region tables 40. For advertising content, distribution center 10 creates a plurality of commercial content descriptors 45 together with their subordinate spot-presentation-time 55 and spot-region 50 tables.

Most content arrives at distribution center 10 on analog media. Once a content descriptor for the newly arrived content is available, a computer based digitizer then digitizes the content and compresses it. The compresses digital content is then stored in a file along with it's corresponding content descriptor. The process for entertainment content and ad spots varies only by the type of information stored in the content descriptors.

Step 80 comprises communication with a security processor to obtain a cipher key. Security processor 25 maintains a list of ciphers that have limited temporal validity. Alternatively, the security processor 25 can generate cipher keys in a pseudo-random manner. Distribution center 10 uses the cipher key as a basis for encrypting all content stored in the compressed digital format.

Step 100 comprises the sorting of content according to delivery regions and presentation times. Distribution center 10 collects statistics about the reliability of the distribution of content over inter-facility computer network 20. Based on the reliability history, distribution center 10 allows sufficient time before content must be presented to subscribers to effect the dispatch of the content to the plurality of facilities. It does so by estimating the time required to transmit e-mail messages together with a plurality of content attachments and the time required by the plurality of facilities 15 to assimilate the content. Once content is identified as being timely for dispatch, it is sorted with other timely content and a list of recipients for each of a plurality of content will be created. This is accomplished by examining the presentation region field of each of the plurality

of entertainment descriptors and their subordinate region tables and creating a recipient list of the facilities 15 that serve a particular region and must receive the content. Where the content is to be nationally presented, each of the plurality of facilities 15 will be placed in the recipient list for that content.

Once the list of e-mail messages are created, distribution center 10 actually composes the e-mail messages. This is done by creating a plurality of e-mail messages corresponding to the content that must be delivered to the plurality of facilities 15. Each of these e-mail messages includes an attachment comprised of the entertainment descriptor and the actual digitized, compressed and encrypted content. These e-mail messages are then sent to all of the plurality of facilities 15 that are listed in the recipient list for that content.

Facility Operation

Fig. 7 shows the internal structure of the facility content processing suite. The equipment required to process content at the plurality of facilities 15 comprises: 1) a plurality of pointcast servers 110; 2) a plurality of frequency converters 120; 3) a plurality of file servers 140; 4) an intra-facility computer network 150; and 5) network combiner 160.

Fig. 8 shows what steps are performed by the plurality of facilities 15 in order to receive content from distribution center 10. These steps comprise: 1) receiving e-mail messages with content attached (170); 2) fetching a fresh cipher key (180); 3) decrypting the content (190); and 4) storing the content in a pointcast server (200).

Step 170 is performed by file server 140. File server 140 receives content from distribution center 10 by means of it's interface to inter-facility computer network 20. File server 140 hosts an e-mail client that participates in standard web-based e-mail exchanges. File server 140 detaches the content from the e-mail message and stores that content in a disk file together with the content descriptor.

Step 180 is also performed by file server 140. Periodically, file server 140 establishes a dial-up connection to security processor 25. Once the connection has been established, file server 140 retrieves a limited number of temporally valid cipher keys.

Step 190, performed by file server 140, uses the cipher key to decrypt the secured content.

Step 200 is the last step in receiving content from distribution center 10. Once the content has been decrypted, it is stored in pointcast server 110. File server 140 uses the content descriptors for all content received to determine the amount of memory required to store the content and where the content ought to be stored. File server 140 maintains a storage map of the content placed in pointcast server 110.

Once the content has been stored in pointcast server 110, file server 140 must then create the pointcasting strategy for delivery of the advertising content received from distribution center 10. The plurality of facilities 15 provide one of two types of services to the subscribers; broadcast and entertainment-on-demand.

Figs. 8A and 8B contrast the distribution network used in the prior art with that of the true "point-casting" paradigm that is part of the present invention. Prior art used a limited number of channels, or conduits, that each carried content to a plurality of subscribers. If more than one subscriber was desirous of viewing the same channel, that one conduit fed content to a plurality of subscribers. In pointcasting, even what would traditionally be called broadcast channels are made dissimilar by introducing demographically targeted advertisements. This means that each and every subscriber would receives a different selection of advertisements event though the entertainment content would be identical.

Fig. 8B shows that the present invention establishes a distinct logical conduit to each and every subscriber. When the subscriber want to view a particular channel, the content from that channel

is "funneled" into that specific conduit that leads directly to the subscriber. Logical conduits in the present invention equate to "content streams" that are composed in real-time by the pointcast server.

When compared to the prior art, the new paradigm immediately reserves the minimum bandwidth necessary to serve all subscribers irrespective of the type of service requested; broadcast or on-demand entertainment. In the prior art, bandwidth would need to be allocated to all of the broadcast channels that had dissimilar content and then this bandwidth would need to be dynamically reallocated to on-demand entertainment.

Fig. 9 presents a flow diagram that describes the process followed by the plurality of facilities 15 to develop the pointcasting strategy. These steps comprise: 1) receiving demographics about subscribers (210); 2) building delivery script tables for the broadcast channels for a plurality of subscribers (220); 3) assigning broadcast advertising spots to the broadcast channel delivery scripts for each of a plurality of subscribers (230); 4)) assigning pointcast advertising spots to the broadcast channel delivery scripts for each of a plurality of subscribers (240); 5) building demand-content delivery list for a plurality of subscribers (250); 6) assigning broadcast advertising spots to the demand-content delivery list for each of a plurality of subscribers (260); 7) assigning pointcast advertising spots to the demand-content delivery list for each of a plurality of subscribers (270).

File server 140 receives demographic information for each of a plurality of subscribers either from distribution center 10 or other external sources. File server 140 can receive the demographic information either via e-mail, through an electronic interface such as a serial or parallel port or it can receive the demographic information by removable data disk.

Fig. 9A shows that the demographic data is received in the form of a list of subscribers wherein each subscriber has a plurality of demographic codes assigned to it. The number of demographic

codes can be limited in order to preclude saturation of that subscriber and rendering the pointcast advertisements ineffective. Demographic information for the plurality of subscribers is stored in subscriber-demographic table 280.

Fig. 9 shows that the next step performed by file server 140 is step 220, building the broadcast delivery script tables. Fig. 10 shows the basic structure of the broadcast delivery script tables 290. A plurality of broadcast delivery script tables 290 are created, one for each of a plurality of subscribers serviced by facility 15.

On a periodic basis, file server 15 examines all of the commercial content descriptors 45 that it is managing at the time of the examination. This is normally accomplished once per day, but any period that is convenient for the cable television system can be accommodated. File server 140 discards any of the commercial content descriptors that have expired relative to the "end date" field of the descriptor. Contemporaneously, file server 140 purges the content linked to the discarded content descriptors.

File server 140 performs step 230 by examining the presentation strategy field of the remaining commercial content descriptors 45 to identify the descriptors that are truly require broadcast delivery of their content and the presentation time field in order to identify those commercials that have mandatory presentation times. The "spot number" assigned to these commercial content descriptors 45 are then assigned to the mandatory time slots in each of the plurality of broadcast delivery script tables 290 according to the mandatory presentation times listed in the spot presentation times table 55 for that commercial content descriptors 45. Once the mandatory presentation spots are assigned, file server 140 then assigns the remaining broadcast spots according to their saturation level and their start and end time slot windows. The saturation level indicates the frequency that an advertisement must be presented to the subscribers in a given time interval. For example, an advertisement might need to be presented 5 times per day. The presentation window indicates during what portion of the day an advertisement must be

presented. Again as example, an advertisement may need to be presented between 6:00 PM and midnight.

File server 140 then performs step 240, assigning pointcast spots. File server 140 identifies all of the commercial content descriptors that have a pointcast delivery requirement. This is done by examining the strategy field of commercial content descriptors 45. Commercial content descriptor 45 not only indicates that the advertisement must be delivered on a demographic basis, it also includes a list of demographic codes 57 (on Fig. 5). The advertisement associated with a particular commercial content descriptor is assigned to a plurality of broadcast delivery script tables 290 for a plurality of customers that have a demographic codes listed in the commercial content descriptor's demographic code table 57. Both the commercial content descriptor's demographic code table 57 and the subscribers' demographic code table 280 contain a plurality of code entries. This enables an advertisement to be presented to a of subscriber whenever any of the plurality of demographic codes in the commercial content descriptor's demographic code table 57 matches any of the plurality of demographic codes in the subscriber table 300. File server 140 respects the start and stop window and mandatory presentation times specified in the commercial content descriptor 45 for each advertisement.

Fig. 9 shows that file server 140 can perform the optional step of building a demand content spot table, step 250. Step 250 results in the creation of a plurality of demand-spot-list tables 300, one for each of a plurality of subscribers. Some cable television systems, or as is disclosed infra, closed entertainment facilities will introduce advertising content when presenting on-demand entertainment.

File server 140 then performs steps 260 and 270 in order to assign commercial content to each of the plurality of demand-spot-lists 300 for each of a plurality of subscribers. In the current embodiment, file server 140 does not honor mandatory presentation times or saturation levels for the advertisements. Rather, commercial content descriptors 45 that specify broadcast delivery are interwoven with pointcast ads. The pointcast spots are assigned to the plurality of demand-

spot-tables 300 based on the demographic code akin to the mechanism followed on step 240 described supra. This mechanism for interleaving broadcast ads with pointcast spots results in a round-robin apportionment of available advertising opportunities given the non-deterministic nature of on-demand content delivery. Whenever a subscriber requests on-demand entertainment, the demand-spot-table for each subscriber is used to determine which advertisement should be presented in the next available advertising opportunity or time slots.

Pointcast Server

Fig. 12 depicts the internal structure of the pointcast server 110. Each of the plurality of facilities 15 can have a plurality of pointcast servers. The number of pointcast servers is determined by the number of subscribers that each facility will serve and the number of subscribers may vary from facility to facility. Operation of pointcast server 110 is based on a plurality of processing cycles. The most basic cycle in pointcast server 110 is based on a quantum of time of presented video. For instance, the current embodiment uses a quantum of 1 millisecond. This means that all data transfers for entertainment content are either delivered to subscribers or discarded on that period. This basic cycle can almost be considered pointcast server 15's heartbeat. Compressed digital entertainment content is formatted into delivery packets of equal length, but the number of packets that constitute a time-length of content presented to subscribers can vary. This is known as variable bit-rate content. The heartbeat enables the circuitry in the pointcast server to deal with variable bit rate content in a deterministic manner.

Fig. 8B introduces the notion of a plurality of distinct virtual conduits emanating from the pointcast server to each of the plurality of subscribers. The pointcast server's primary function is to develop content streams for each of the plurality of subscribers that each facility 15 serves.

Fig. 12A demonstrate that the content stream for any subscriber "n" is composed by presenting some entertainment content, either broadcast or on-demand, and the introducing commercials into the content stream. The commercial to be inserted into the content stream is that commercial specified in the broadcast delivery script 290 for that subscriber for the given time slot. As

shown in the figure, the first advertisement is specified by a "spot number" of "1". This corresponds to the spot number stored in the first ad slot in broadcast delivery script 290 beginning at midnight (00:00).

File server 140 determines which broadcast or on-demand content must be delivered to each of the plurality of subscribers. The entertainment content selection mechanism is described infra. File server 140 communicates to pointcast server 110 what content is to be delivered to each of the plurality of subscribers. File server manages the delivery of entertainment content and commercial content. The management process varies slightly between broadcast and on-demand entertainment content delivery. For on-demand entertainment, file server 140 calculates the amount of entertainment content that must be delivered before the first commercial is presented. Based on this time, file server 140 indicates the length of content to be delivered to a subscriber. File server 140 then indicates the storage location of the content based on the base storage location of the content as stored in pointcast server's cache 310 plus any offset to account for the elapsed time that the entertainment content has already been presented to the subscriber.

File server 140 then examines the demand-spot-table table 300 to determine what advertisement must be presented at the current time slot. File server 140 communicates to pointcast server 110 the location of the commercial content as stores in it's content cache 310 together with the length of the commercial. This process continues continuously to form the content stream. File server 140 tags each of these content delivery commands with a virtual conduit number that corresponds to one of the plurality of subscribers.

For broadcast content, file server 140 uses information in the plurality of broadcast delivery script tables 290 to select the commercials that are to be inserted into the broadcast content streams for each of the plurality of subsceribers. When delivering on-demand entertainment, file server 140 calculates the amount of entertainment content that must be presented to the subscriber before inserting a commercial. For broadcast content, in contrast, file server 140 only specifies a queue of commercials that must be presented to each of the plurality of subscribers.

Circuitry on cable tuner assembly 320 and satellite tuner 330 monitors the incoming content and presents an indicator that enables the insertion of local commercial content into the content stream.

Fig. 13 shows the structure of tuner assembly 320. Tuner assembly 320 comprises tuner 380; analog demodulator 390; video analog-to-digital converter 400; audio analog-to-digital converter 410; processor 420; memory 430; delivery interface 440; external content demand requestor 450; and multi-state demodulator 460.

In operation, tuner 380 is digitally tuned to an analog television station that it receives either from a cable television feed or of the air via an antenna. The output of the tuner is then fed to analog demodulator 390. Analog demodulator 390 will recover video and audio information from the modulated carrier received by tuner 380. The video and analog information is digitized by video and audio analog-to-digital converters 400 and 410 respectively. The digitized information is the processed by processor 420 in accordance with a program stored in memory 430. Processor 420 compresses the video and audio information into a compressed video/audio data stream that it deposits in delivery interface 440. The current embodiment compresses the digitized entertainment into MPEG.

Alternatively, tuner 380 may be digitally tuned to receive a multi-state modulated digital channel that carries a plurality of entertainment content streams. Multi-state demodulator 460 demodulates the carrier and extracts the entertainment content streams. The entertainment content streams, which are received as time multiplexed packets, are forwarded by processor 420 to delivery interface 440. The present invention relies on a form of multi-state modulation called quadrature amplitude modulation that defines a plurality of modulation states being combinations of quantum amplitudes and quantum phase shifts.

External content demand circuit 450 monitors the output of analog demodulator 390 for indicators that local commercials can be inserted into the content. The current embodiment uses

a subcarrier tone to identify advertising insertion epochs but other indication mechanisms are possible. The output of content demand circuit 450 is made available to the plurality of content stream packers 340 integral to pointcast sever 110. When tuner assembly 320 is receiving digital content streams demodulated by multi-state demodulator 460, advertising opportunities are marked by a special data code embedded in the streams. In this case, content stream packers 340 monitor the content stream and when the advertising opportunity marks are discovered, local content is inserted into the content stream.

Delivery interface 440 serves two functions: first, it provides transfer elasticity and second it stores content so that it can be delivered to a plurality of subscribers. Elasticity is provided by means of two alternating buffers operating in a ping-pong fashion. While processor 420 is filling packets of compressed content into one of the buffers, content stream packers 340 are reading data from the other to satisfy their content delivery requirements. In order to satisfy the demand for content from a plurality of content stream packers 340, delivery interface maintains the content current so that any number of the plurality of content stream packers 340 can obtain the data. The alternating buffers ping-pong when the pointcast server's heartbeat, described about, ticks.

Fig. 14 shows that the satellite tuner assembly 330 used in pointcast server 110 is identical in structure to tuner assembly 320. The only difference betwixt the two is that tuner 320 on tuner assembly 320 is replaced with satellite tuner 470. Satellite tuner 470 is capable of receiving signals from earth-orbiting satellites. Aside from this, all other functions of satellite tuner assembly 330 remain identical to that of tuner assembly 320.

Fig. 12 shows that pointcast server's control processor 370 interfaces to the intra-facility computer network 150. Control processor 370 receives content delivery scripts for each of a plurality of content streams, one for each subscriber. The content delivery sequences comprise messages received from file server 140 that define what content is to be next presented to each of the plurality of subscribers. The character of the messages received from file server 140 is

demonstrated in Fig. 12A and comprises an address of content stored in pointcast server's content cache 310 and a length value.

Content cache 310 stores entertainment and commercial content in a compressed digital format. The compressed digital content is organized into packets of equal size. Hence, a segment of entertainment or commercial content is actually comprised of a plurality of equal length packets.

Fig. 17 shows that alternate embodiments with non-equal length packets can be readily accommodated by packet descriptor 600 used by content stream packer 340. Control processor 370 calculates the physical address of each packet that comprises a segment of content that must be next presented to each of the plurality of subscibers. Control processor 370 creates a plurality of packet descriptors 600 in it's own local memory for a plurality of content segments for a plurality of content streams. Packet descriptors include the address of the content packet as stored in content cache 310, the length of the packet, the type of the packet and the address of the next packet descriptor as stored in control processor's 370 local memory. Content streams correspond to a virtual conduit from the pointcast server to each of the plurality of subscribers.

Fig. 17A shows that each of the plurality of content stream packer 340 used in pointcast server 110 generates a multi-state modulated channel comprising a plurality of streams. Hence, each modulated channel serves a plurality of subscribers. As shown in the figure, "n" content streams are carried in the channel. In the present invention, content stream packer 340 collects ten streams to form a channel. The number of streams that can be collected into a multi-state modulated channel is based on the bit-rate of the content stream and the aggregate capacity of the channel to carry digital data.

Control processor 370 controls the sequence of content delivery by dispatching the address of the first packet descriptor for each of a plurality of streams to content stream packer 340. Referring to Fig. 15, content stream packer 340 receives the plurality of packet descriptors 600

in to it's queue management circuit 480. Queue management circuit 480 comprises control circuits and a plurality of stream organizers. Each of the plurality of stream organizers manages a single content stream. A stream organizer fetches a packet of content from content cache 310 and stores the packet into a corresponding stream FIFO (first-in-first-out) memory 490. Stream organizers also tags each packet with a stream identification number that corresponding to a subscriber. The identification number is stored in FIFO memory 490 immediately before the packet. This stream identification number is used by the content reception unit at each subscriber to select a content stream for presentation to the subscriber.

The control circuits comprising queue management circuit 480 move the packets, and their corresponding stream identification numbers, from FIFO memory 490 into stream multiplexer 500. Stream multiplexer 500 interleaves the packets and delivers them to forward error correction unit 510. Forward error correction unit 510 accepts parallel data from stream multiplexer 510, generates error correction and detection syndromes and wraps the packet data and the syndromes in a transport package. The transport package is then directed to multi-state modulator 520 which modulated the time division multiplexed content streams onto an intermediate frequency carrier channel. The intermediate frequency carrier channel is filters by filter 530 to remove unwanted aliases created by the digital modulation techniques used by multi-state modulator 520. In the present invention, forward error correction unit 510and multi-state modulator 520 are embodied together in a single integrated circuit.

Referring to Fig. 17, once the packets are moved by the stream organizer in queue manager circuit 480 into FIFO memory 490, the control circuit in queue manager circuit 480 fetches the next packet descriptors for each of the plurality of streams from control processors 370 local memory and processes the next packets for the plurality of streams. These time-division-multiplexed packets then form a multi-state modulated channel as shown in reference number 610.

Fig. 12 shows that pointcast server 110 includes disk controller 360 and disk farm 365. Prior art content servers have used a plurality of disk drives using striping techniques to delivery content directly to a content stream packer. The prior art has two distinct disadvantages that the present invention cures. First, the use of disk drive for direct content delivery is unreliable. Data read from disk drives is susceptible to errors. In the event that errors are detected, the latency of the rotating media is so excessive that the content stream packer will experience a data under run. This under run results in loss of synchronization at the subscriber that is manifest as a momentary frozen display screen. Disk drives are also unreliable in that they are mechanical devices. Delivery of entertainment content requires high utilization factors of the disk drives. This results in a severely abbreviated useable life of the disk drives and they must be replaced frequently. The second disadvantage associated with using disk drive for direct content delivery is that the striping techniques used to increase content retrieval bandwidth requires significant management of the streams. A plurality of high speed processors are required to manage the access to the packets stored on the disk drives.

The present invention's pointcast server 110 stores the packets that comprise content segments in high bandwidth random access memory. The random access memory is not plagued by disk-read errors and hence, the presentation of "frozen screens" due to lost packets to subscribers is mitigated. Use of random access memory for delivery of packets to the plurality of content stream packers 340 requires less processor management because the packets are not interleaved on striped disks and are stored in deterministic memory locations. Random access memory has almost two orders of magnitude more bandwidth for content retrieval. This means that more subscribers can be serviced simultaneously.

Digital entertainment content is extremely voluminous. The present invention provides a content cache that stores 30 full-length movies and a commercial content for one hour of presentation to a plurality of subscribers. The amount of content that the current embodiment can manage is presented only for the purpose of demonstrating typical sizes. The amount that can be managed can be varied as advertising and programming requirements change.

Control processor 370 receives both entertainment content and commercial content from file server 140 on a periodic basis. Control processor also receives entertainment content descriptor 35 and commercial content descriptor 45 for each of the plurality of content segments it receives from file server 140. Control processor 370 stores the content and the descriptors onto disk drives in disk farm 365 using conventional disk file management techniques. When pointcast server 110 first powers up, or when a reboot is required, control processor 370 creates a memory map that indicates what content is to be stored at what memory address location based on the load addresses specified in the content descriptors 35 and 45. Control processor 370 commands disk controller 360 to copy the content from disk farm 365 to the random access memory comprising content cache 310 in accordance with the memory map.

Not all of the content is copied directly from disk farm 365 to content cache 310. File server 140 indicates to control processor 370 what commercial content will be needed to form content streams in the upcoming period. Control processor 370 moves only that select set of entertainment content to the content cache. By moving the digital content to content cache 310 based on a priori knowledge of what content will be required in the upcoming period, the amount of random access memory needed to store content is reduced. In the present invention, the digital representation of advertisements that will be presented to a plurality of subscribers in the upcoming hour are copied to content cache 310.

The disk farm is likely to store entertainment content that will not always be presented to the subscribers. Popular entertainment content is copied to content cache 310 so that a multiplicity of demands for that content can be serviced. Other content, such as classic movies, may be stored in disk farm 365 and copied to content cache 310 only as needed. In a typical cable television system, the menu of on-demand entertainment that a subscriber can select from may include popular movies that are always available and a selection that varies with the time of day. For instance, some on-demand content may only be available late at night (adult entertainment) or early in the morning (children's programming or educational programs). The size of disk farm

365 and content cache 310 can be varied to accommodate the needs of different facilities within the network.

Frequency Converter

Fig. 7 shows that the output of pointcast server 110 is a plurality of multi-state modulated channels. As described supra, these multi-state modulated channels are modulated onto an intermediate frequency carrier. The plurality of intermediate frequency carriers are directed into frequency converter and combiner 120. In order to distribute the plurality of multi-state modulated intermediate frequency carriers to a plurality of subscribers, they must be converted to different carrier frequencies so that they can coexist on a single cable capable of propagating RF signals.

Fig. 18 shows the internal structure of frequency converter and combiner 120 comprising a plurality of converter modules 650, a low phase noise oscillator 660 a passive combiner 680 and a control processor 670.

Multi-state modulated carriers are susceptible to errors induced by excessive phase or amplitude jitter. In order to mitigate the amount of noise, any frequency conversion must be based on stable frequency references. Not atypical of the stability required for such conversions would include a reference oscillator with phase noise of less than –120 dB. Such low phase noise references are costly. Frequency converter and combiner 120 uses a common low-noise oscillator 660 frequency reference that is disseminated to a plurality of converter modules 650.

The outputs of the plurality of converter modules 650 will be multi-state modulated carriers centered at distinct frequencies. These are then combined in passive combiner 680. A passive combiner is used to reduce the likelihood that the all channels will not be propagated due to the failure of a common active component. Passive combiner 680 includes an upstream input. A

plurality of frequency converter and combiners 120 can be serially wired to combine more multi-state modulated carriers (converted to different frequencies) onto a single cable.

Control processor 670 receives programming information from file server 140 for each of the plurality of converter modules. Each converter module 650 is programmed to a different and distinct conversion frequency to form a spectrum of channels to be delivered to a plurality of subscribers. Control processor 670 creates control words that it send to each converter module 650 to establish the required conversion frequency.

Fig. 19 shows the internal structure of converter module 650 comprising up-mixer 700, pass-band filter 710, down-mixer 720, low-pass filter 730, amplifier 740, power meter 750, phase-locked-loop 760 and a plurality of voltage controlled oscillators 770. The intermediate frequency received from pointcast server 110 is immediately converted up in frequency by mixing it with a high-order harmonic of the precision low-noise reference obtained from low-noise oscillator 660. The output of up-mixer 700 is then pass band limited by filter 710. The pass band filter is of such quality that all energy outside of the band is attenuated so that it would not interfere with other channels in the channel spectrum distributed to the plurality of subscribers served by facility 15. The pass-band limited signal is then down converted to the desired frequency. Phase-lock-loop 760 control VCO 770 to create a mixing frequency such that the lower side band of the output of down-mixer 720 is the desired carrier frequency.

Again noting the need to maintain low phase noise through the entire propagation path for the multi-state modulated carrier, converter module 650 employs a banked VCO structure. Using a single VCO with a wide range results in poor phase control that impairs the propagation path. The usable service range of converter module 650 is segregated into bands. The bands overlap to ensure that all frequencies can be achieved. Control processor 670 enables only one of the VCO in each of the plurality of converter modules 650 corresponding to the required frequency band. The power to non-selected VCO is disabled to ensure that inter-modulation distortion is eliminated. To further isolate the VCOs within the bank, the outputs of each VCO are

multiplexed using PIN diode switches. The PIN diode switches are configured such that the output of one VCI is not corrupted by the disabled circuitry of the other VCOs. The isolation must be sufficient to preclude perceptible interference with the multi-state modulated signal path.

The output of down-mixer 720 comprises both a desirable lower side band and an undesirable upper side band components. Low-pass filter 730 disposes of the undesired upper side band before the desired signal is amplified by amplifier 740. The output level of amplifier 740 is controlled by a control word received from control processor 670. Each channel in that is combined by passive combiner 680 can be set to a different level by amplifier 740. This is a required trait to compensate for non-uniform cable losses between the output of frequency converter and combiner 120 and the first amplifier in the distribution system described infra. This enables the frequency converter and combiner to digitally compensate for the slope of the distribution cable.

Fig. 19A shows the functionality of the digital slope correction. If the output levels of all of the RF channels developed by frequency converter and combiner 120 were to be set to approximately the same level, as shown in inset 800, the non-uniform losses introduced by cable 805 would result in non-uniform signal levels at the first amplifier. Based on a priori knowledge of the cable installation at the facility, control processor 670 sets the output level of the channels progressively higher as the frequency of the channels increases as seen in inset 820. The non-uniform cable losses will attenuate higher frequency signals with more loss resulting in an essentially flat delivery of the channel spectrum at the receiving end of the cable.

Power meter 750 is used to provide automatic gain control to amplifier 740. The automatic gain control helps to regulate the output level of the amplifier as temperature and voltage levels in and around converter module 650 vary. Power meter 750 provides power level feedback to control processor 670 needed to implement the digital slope correction function. Power meter 750 is calibrated at manufacturing time by storing calibration coefficients in flash memory 751. Control

processor 670 uses the coefficents to correct readings obtained by power meter 750 and to convert them to useful engineering units such as dBm.

Network combiner 160 (on Fig. 7) comprising a diplex filter combines the base-band component of a computer network connected to file server 140 with the RF component that is generated by the frequency converter and combiner 120. This composite spectrum is then distributed by the distribution system.

Facility Distribution

Fig. 20 illustrate that a typical cable television distribution system carries programming content, normally analog modulated television and radio signals, from a head-end source and disseminates the signals throughout a neighborhood. A branch-node 850 amplifies 860 the signals and then splits 870 the signal by dividing the power down a plurality of branches. This branching scheme is replicated to the extent required to service a plurality of subscribers 880. In the previous art, each subscriber 880 simply selected a broadcast channels from among a plurality of channels available on the distribution cable 890. The subscriber used a television set to tune to the desired channel.

In the new paradigm of the present invention, each of the subscribers is assigned a virtual conduit and programming content, including entertainment and commercials, is funneled to the specific subscriber. Subscribers can not longer passively tune to a channel to receive content. Subscribers must replace their television sets with a digitally capable reception unit. The digitally capable reception unit still presents the traditional "channel surfing" paradigm to the subscriber 880, but instead of passively tuning to a channel, the digital reception unit sends a request back to file server 140 indicating that different content must be funneled into the virtual conduit for that subscriber.

The need for communicating content requests back to file sever 140 requires a modification to the existing distribution system. And most notably, the branch-node 850, which is a unilateral

device, must be replaced by a digital-branch-node 900. Digital branch node 900 enables the amplification of RF channels akin to it's predecessor, but it also enables the propagation of a computer network in the base-band portion of the cable's spectrum.

Fig. 21 depicts the topology of digital-branch-node 900 that supports the use of a carrier sensed multi-access collision detection computer network such as Ethernet. A signal entering digital-branch-node 900 is first split into a base-band component and an RF component by diplex filter 910. The RF component is then amplified by amplifier 920 and the divided into a plurality of branches by splitter 930. The base-band component is then impedance terminated by terminator 940 and then directed to one of a plurality of transceiver modules. Each transceiver module propagates the base-band component to one of a plurality of branches. The base-band branches are combined with the RF components by a plurality of diplex filters 910. Controller 950 monitors the activity of the base-band signals arriving at each side of each transceiver. The root and branches of digital-branch-node 900 can all be considered network ports for a computer network. When activity is detected on any one of the branches or at the root of digital-branch-node 900, the appropriate transceiver is enabled to propagate the signal out through to the inactive ports. Controller 950 disables the transceivers when the triggering activity desists. All ports are terminated by base-band terminators 940 to mitigate transmission reflections in the cable plant.

Cable Television Installation

Fig. 22 demonstrates how a typical cable television system distributes content to a plurality of houses each subscribing to cable television services. Cable television companies collect revenue from the plurality of subscribers, but also collect revenue from a plurality of advertisers desirous of promoting their products, services or viewpoints.

In the prior art, a cable television system would deliver the same content to all subscribers within their network. Any advertisements that were to be presented to the community would be

presented to all subscribers. This meant that their was a finite amount of time, given the presentation of entertainment and commercials, that could be sold to advertisers.

In order to install the present invention, the cable television company must replace the head-end 1000 with the distribution center 10 that is part of the present invention. The cable company must segregate it's distribution network into clusters of proximately related subscribers and assign those to one of a plurality of facilities. Each of the facilities must have the compliment of equipment described in Fig. 7, namely pointcast server 110, file server 140, frequency converter and combiner 120 and network combiner 160. The distribution system must be upgraded to include digital-branch-nodes 900 enabling high speed computer network communication between the plurality of subscribers and file server 140.

By installing the present invention, the cable television system can use a novel technique for selling advertising, that is by targeting subscribers with specific demographics. Since advertisers are more interested in reaching a specifically targeted audience, the cable television company can command a similar, if not greater price for presenting advertising content. Since the pointcast server can route dissimilar content to each subscriber in a facility, the cable company can sell a greater number of advertising spots, corresponding to a plurality of demographically distinguished target groups that can be addresses simultaneously. Hence, the present invention improves the effectiveness of advertiser's commercials and creates additional bandwidth in the distribution network enabling the cable companies to achieve more advertising revenue from an existing subscriber base.

The cable company can also charge a service fee for use of the base-band computer network carried on the distribution cable. Subscribers can have high-speed bi-directional access to global computer networks such as the Internet. File server 140 includes router software that enables any computer to access the internet so long as the appropriate permission is enabled. The permission mechanism is used to regulate and charge subscriber Internet use of use of other global computer networks.

Custom Distribution Networks

Fig. 23 demonstrates how the present invention is used in the establishment of specialized broadcasting networks, specifically to a hospital or elderly care center. The concept includes the development of custom broadcasting networks based on targeting subscribers that are demographically similar.

Subscribers need not be homes in a neighborhood. Subscribers may be hospital beds as described in one preferred embodiment. The facility equipment of Fig. 7 is installed at a plurality of hospitals, elder care facility, retirement complexes to establish a custom distribution network catering to the sick, elderly and retired. The custom distribution network presents demographically targeted advertising to a plurality of subscribers at those facilities.

The custom distribution network operates as a national cable television system and sells advertising spots to pharmaceutical companies and others based on the demographics supplied by hospital computers. This ensures that hospital patients that are suffering from a particular illnesses will be presented with advertisements for medicines that they could consider taking. In this situation, hospital computers interface with file server 140 to ensure that any targeted advertising meeting with the approval of a patient's physician. This is done by filtering the advertisements for certain drugs or services from the broadcast delivery script 290 and on-demand-spot table 300 for a particular patient. As another example, patients that need physical therapy will be exposed to advertisements from rehabilitation clinics proximate to the patient's home address as received from the hospital's computer. The custom distribution network also includes specialized entertainment content that serves as rehabilitation training for patients recovering from particular procedures.

The hospital environment shown is Fig. 23 requires a specialized reception unit.

In retirement complexes, pointcast advertising is sold to golf courses that offer senior discounts, to physical therapy clinics, to pharmaceutical companies, and to other companies that offer services to retired persons.

Reception Unit

Fig. 24 depicts the structure of a cross reference list 1200 that maps each subscriber to a content stream. File server 140 develops cross-reference list 1200 based on a priori knowledge of the subscriber population. Each reception unit in the population is assigned a distinct network address when it is installed at the subscribers location. The subscriber number is used to select an entry from cross reference list 1200. The network address then gives file server 140 the ability of communicate directly with the reception unit using the intra-facility computer network as distributed to all subscribers using the base-band portion of the distribution cable. Upon system start-up, or whenever the system must be rebooted, file server 140 assigns content streams to each of the plurality of subscribers listed in cross reference table 1200. Stream assignment comprises the assignment of a multi-state modulated channel, which carriers a plurality of streams, and a distinct stream within that channel. The stream assignment is then communicated to the reception unit based on the network address.

Fig. 24A depicts the structure of the reception unit 1250. Reception unit 1250 comprises a diplex filter 1260, radio frequency tuner 1270, multi-state demodulator 1280, direct memory access (DMA) controller 1290, memory 1300, audio digital-to-analog converter 1320, graphics controller 1310, central processing unit 1330, flash memory 1340, network interface 1350, touch screen interface 1360, and key-sense interface 1370.

Diplex filter 1260 separates the RF spectrum from a base-band spectrum carried on the cable. The RF spectrum carries a plurality of multi-state modulated carriers. Each of these multi-state modulated carriers carries a plurality of content streams. Central processing unit (CPU) 1330 executes a sequence of instructions to communicate with file server 140. Immediately on start-

up, CPU 1330 communicates with file server 140 to discover what virtual conduit must be selected for the instant subscriber. File server 140 responds to the request with a channel number and stream number as stored in the cross reference list 1200. CPU 1330 then commands RF tuner 1270 to digitally tune to the channel identified by file server 140. CPU 1330 commands DMA controller 1290 to extract only the one content stream from that channel as identified by file server 140.

Once RF tuner 1270 tunes to the required RF channel, multi-state demodulator 1280 begins to demodulate the multi-state modulated carrier. Multi-state demodulator 1280 performs forward error correction and extracts data from the carrier package. Multi-state demodulator 1280 delivers discrete packets of compressed digital entertainment content wherein each packet is identified by a stream number. DMA controller 1290 collects the data packets that correspond to the stream number assigned to the instant subscriber and stores same into memory 1300.

Once DMA controller stores packets of compressed digital content in memory 1300, it notifies, by interrupt, CPU 1330 that content is available. CPU 1330 responds to DMA controller's 1290 interrupt by executing a sequence of instructions that enable CPU 1330 to de-compress the instant data packet. CPU 1330 decompresses a plurality of data packets to form a screen of video content and a segment of audio content. CPU 1330 commands graphics controller 1310 to display the video content on a display. Graphics controller 1310 provides digital video signals or analog video signals to either a digital video monitor or to an analog display unit. CPU 1330 moves the decompressed audio content to audio digital-to-analog (D/A) converter 1320. Audio D/A 1320 then provides an analog signal to a speaker that represents the audio information.

Reception unit 1250 includes a key-sense interface 1370. Key sense interface 1370 senses key activation from a subscriber (human user). These key activation events correspond to channel surfing instructions. When CPU 1330 recognizes a key-activation, it communicates a channel request to file server 140 using network interface 1350. Network interface 1350 gains access to the base-band spectrum of the distribution cable by means of diplex filter 1260. File server 140

responds to the channel request by feeding different entertainment content into the virtual conduit assigned to the instant subscriber.

Fig. 24B shows that the analog display unit comprises an NTSC video modulator 1400. NTSC video modulator accepts the analog video and audio signals from reception unit 1250 and forms an NTSC modulated signal. The NTSC modulated signal is then fed to a television receiver for final presentation to the subscriber.

Fig. 24C shows that the key-senses are initiated by either a keyboard or an infra-red remote control receiver, both or either of which may be mounted proximate to the reception unit 1250. Keyboard 1410 comprises several numeric keys, up-down channel surfing keys and an enter key. Said keys are used by a human user (subscriber) to select programming content. Remote control 1430 comprises the identical key set that comprises keyboard 1410. Remote control 1430 emits infra-red modulated light that is detected by infra-red sensor 1420. The output of keyboard 1410 and infra-red sense circuit 1420 are directed to key-sense interface 1370 integral to reception unit 1250.

Hospital Reception Unit

Fig. 25 demonstrates a novel mounting configuration for reception unit 1250. This configuration comprises adjustable bed 1520 comprising console 1500 that is mounted on or proximate to bed-rail 1510. The electronic equipment comprising reception unit 1250 is mounted within console 1500.

Console 1500 serves as a base for display head 1540 that is suspended in an arbitrary position by flexible conduit gooseneck 1550. When a patient wants to watch entertainment content, flexible gooseneck 1550 is positioned to enable viewing of the display head while maximizing patient comfort.

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Fig. 26 shows an alternative mounting of the display head 1540. In this alternative embodiment, display head 1540 is pivotally mounted on stud 1600. Stud 1600 is itself mounted on extension 1610. Extension 1610 is split in the middle to enable one end to be rotated relative to the other in the longitudinal axis. Extension 1610 is pivotally mounted on to riser 1620. Riser 1620 is pivotally mounted within the console in the same plane as the console face as viewed from the inside of the bed.

Display head 1540 can be stowed within console 1500 by rotating display head 1540 about stud 1600 so that it is located directly above extension 1610. Extension 1610 is the rotated about riser 1620 until display head 1540 is above stowage slot 1630. Riser 1620 is then rotated about the face of console 1500 until it is disposed within stowage slot 1630.

Fig. 27 shows the alternative display head when stowed in stowage slot 1630.

For either the primary gooseneck mounting or the alternative arm-assembly embodiment, console 1500 is mounted on or proximate to bed-rail 1510. Bed-rail 1510 is pivotally mounted about the longitudinal axis of the bed on bed-rail extension 1655. Bed-rail extension 1655 is concentrically mounted in bed-rail slide-mount 1650. Bed-rail 1510 can then be rotated downward so that is rests along side of the bed or can be moved downward into slide-mount 1650. This lets hospital staff move console 1500 out of the way when direct access to the patient is required.

Fig. 28 depicts display head 1540 as comprising flat panel display 1700, touch screen sensor 1710 and keyboard assembly 1720. Flat panel display 1700 accepts digital or analog video signals from graphics controller 1310 in reception unit 1250 and displays video content to a hospital patient. Touch screen sensor 1710 reports the location of a "screen-touch" to relative to one corner of flat panel display 1700 to CPU 1330. This enables CPU 1330 to create touch-sensitive menus to enable patients to control the display of entertainment content. Keyboard 1720 is used to enable a hospital patient to select entertainment content or other

special functions directly that are not conducive to traversing a graphical menu sequence. These may include intercom, nurse-call functions or control of action games that the hospital patient may be playing. Display head 1540 also includes a small speaker 1730 and an ear-phone receptacle 1740 to enable the presentation of audio content to the hospital patient.

Alternative Embodiments

While this invention has been described in terms of several preferred embodiments, it is contemplated that alternatives, modifications, permutations, and equivalents thereof will become apparent to those skilled in the art upon a reading of the specification and study of the drawings. It is therefore intended that the true spirit and scope of the present include all such alternatives, modifications, permutations, and equivalents.